Junlin Ou

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Education

- **University of South Carolina**
- Ph.D. in Mechanical Engineering Jan. 2020-Dec. 2023
- **Northwestern Polytechnical University**
- M.S. in Armament Science and Technology Sep. 2016-Jun. 2019
- B.S. in Mechanism Design, Manufacturing and Automation Sep. 2012-Jul. 2016

Research Interest

- **High Performance Computing, and Artificial Intelligence in Robotics and Autonomous Systems**
- GPU and Edge Computing
- Path and Route Planning
- Computer Vision and Deep Learning
- Reinforcement Learning and Control

Research Experience

- **Autonomous Multi-Robot Cooperation and Real-time Planning (Funded by DoT and SPARC Graduate Research Grant)** Jan. 2020-Present
  - Developed innovative initialization methods and integrated them with various approaches, including reinforcement learning, genetic algorithm, A*, Dijkstra's algorithm, dynamic programming, among others to enable real-time path planning for mobile robots in dynamic environments.
  - Developed a low-cost indoor positioning system (around $300) for the localization of mobile robots.
  - Developed a heterogenous computing platform (CPU+GPU) to accelerate the path planning process.
  - Optimized PID controllers to improve control stability and reliability of mobile robots.
  - Deployed GPU-enabled path planning algorithms and ROS on Jetson Nano, Jetson TX2, Jetson Xavier NX, and Jetson AGX Xavier edge devices.
  - Developed a ROS framework to enable wireless communication among multiple robots.
- **First Responder Dispatching Route Planning (Funded by FRA)** Jun. 2022-Present
  - Developed rapid routing algorithms for first responders, specifically for scenarios with road blockage and congestion.
  - Accelerated the routing process using GPU computing.
- **Real-Time Health and Security Monitoring and Diagnosis of Manufacturing Systems Based on Energy Consumption Auditing (Funded by US Air Force)** May. 2022-Present
  - Developed a side-channel energy auditing approach and a system on Raspberry Pi to read voltage, current, and power consumption data during robot operation.
  - Integrated OctoPrint and ROS on a Raspberry Pi to monitor the operating status of a 3D printer.
  - Developed a novel method utilizing the Specific Energy Consumption (SEC) model to detect anomaly during the 3D printing process.
- **Assessment of Reliability and Effectiveness of Multi-AUV systems** Dec. 2015-Jun. 2019
  - Developed an improved model for evaluating the effectiveness of multi-Autonomous Underwater Vehicle (AUV) systems within the Weapon System Effectiveness Industry Advisory Committee (WSEIAC) framework.

- Analyzed the effect of nodes movement, temperature, and salinity on reliability of multi-AUV systems.

Journal Publications

1. **Ou, J.**, Song, G., & Wang, Y.. GPU-enabled Path Planning based on Global Evolutionary Dynamic Programming and Local Genetic Algorithm Optimization. Engineering Applications of Artificial Intelligence. (under review)
2. Wei, X., Ma, D., **Ou, J.**, Song, G., Guo, J., Robertson, J. W., ... & Liu, C. (2024). Narrowing Signal Distribution by Adamantane Derivatization for Amino Acid Identification Using an α-Hemolysin Nanopore. Nano Letters.
3. **Ou, J.**, Hong, S. H., Song, G., & Wang, Y. (2023). Hybrid Path Planning based on Adaptive Visibility Graph Initialization and Edge Computing for Mobile Robots. Engineering Applications of Artificial Intelligence, 126.
4. Yang, H., **Ou, J.**, & Wang, Y. (2023). Neural-physics multi-fidelity model with active learning and uncertainty quantification for GPU-enabled microfluidic concentration gradient generator design. Computer Methods in Applied Mechanics and Engineering, 417, 116434.
5. **Ou, J.**, Hong, S. H., Kyzer, T., Yang, H., Zhou, X., & Wang, Y. (2023). A low-cost indoor positioning system based on data-driven modeling for robotics research and education. Robotica, 1-20.
6. Hong, S. H., **Ou, J.**, & Wang, Y. (2022). Physics-guided neural network and GPU-accelerated nonlinear model predictive control for quadcopter. Neural Computing and Applications, 1-21.
7. Hong, S. H., Shu, J. I., **Ou, J.**, & Wang, Y. (2022). GPU-enabled microfluidic design automation for concentration gradient generators. Engineering with Computers, 1-16.
8. **Ou, J.**, Hong, S. H., Ziehl, P., & Wang, Y. (2022). GPU-based Global Path Planning Using Genetic Algorithm with Near Corner Initialization. Journal of Intelligent & Robotic Systems, 104(2), 1-17.
9. Liang, Q., **Ou, J.**, & Xue, Z. (2020). All-terminal reliability of multi-AUV cooperative systems in horizontally stratified SOFAR channel. Ships and Offshore Structures, 15(5), 474-478.
10. Liang, Q., **Ou, J.**, Shi, L., & Zhang, X. (2020). Optimization of multiple autonomous underwater vehicle cooperative system communication network topology based on total energy consumption. Proceedings of the Institution of Mechanical Engineers, Part M: Journal of Engineering for the Maritime Environment, 234(3), 668-675.
11. Liang, Q., Sun, T., & **Ou, J.**. (2019). System reliable probability for multi-AUV cooperative systems under the influence of current. The Journal of Navigation, 72(6), 1649-1659.
12. Liang, Q., **Ou, J.**, Xue, Z., & Ippolito, C. (2019). Influences of temperature and salinity on holistic network performability of multi-AUV cooperative systems. ISA transactions, 93, 165-171.

Conference Proceedings

1. **Ou, J.**, Hong, S. H., & Wang, Y. (2023, April). Adaptive Visibility Graph Initialization on Edge Computing to Accelerate Hybrid Path Planning for Mobile Robots. In SoutheastCon 2023 (pp. 411-417). IEEE.
2. Chandarana, P., **Ou, J. (co-first author)**, & Zand, R. (2021, October). An Adaptive Sampling and Edge Detection Approach for Encoding Static Images for Spiking Neural Networks. In 2021 12th International Green and Sustainable Computing Conference (IGSC) (pp. 1-8). IEEE.
3. Liang, Q., **Ou, J.**, Zhang, X., & Wang, Y. (2020, November). A kind of effectiveness of searching submarine for multiple Autonomous Underwater Vehicle cooperative systems. In 2020 3rd International Conference on Unmanned Systems (ICUS) (pp. 195-202). IEEE.
4. Liang, Q., **Ou, J.**, Yan, X., & Zhang, X. (2018, October). Effect of nodes movement on all-terminal reliability of multi-AUV cooperative system. In OCEANS 2018 MTS/IEEE Charleston (pp. 1-6). IEEE.

Grant and Award

- **Second place** in the **Poster Presentation Competition** in **Discover USC 2024** Apr. 2024
- **SPARC Graduate Research Grant** (Title: Autonomous Multi-Robot Cooperation and Real-time Planning for Intelligent Manufacturing and Warehousing; Award Amount: $4,991.00) Jan. 2023
- **National Excellent Master Dissertation Award nomination**, China Ordnance Society, Beijing, China. Mar. 2021
- **Second Prize**, the 6th National Competition of Design and Production of Underwater Vehicle, Xi'an, Shaanxi, China. Aug. 2017
- **Participation Award**, the 20th International RoboSub Competition in San Diego, USA. Jul. 2017
- **Platinum Award**, Robot Innovation Competition in northwestern division, Shaanxi, China. May. 2017
- **Second Prize of the Excellence Scholarship**, Northwestern Polytechnical University. Nov. 2015
- **First Prize**, Mathematical Contest in Modeling in Northwestern Polytechnical University. May.2015
- **Second Prize of the Excellence Scholarship**, Northwestern Polytechnical University. Nov. 2014
- **Second Prize of the Excellence Scholarship**, Northwestern Polytechnical University. Nov. 2013

Work Experience

- **Postdoctoral Fellow** University of South Carolina Jan. 2024- Present
- **Graduate Research Assistant** University of South Carolina Jan. 2020- Dec. 2023
- **Grader** University of South Carolina Sep. 2023- Dec. 2023

Mentoring Experience

- **Yichuan Cao, Ph.D. student** Aug. 2022-Present
- **Tianqi Huang, ME student** Aug. 2021-May. 2022

Professional Skills

- **Software**
  - Proficient in Python, MATLAB, ROS, C++, VS Code, Anaconda, and Microsoft Office.
- **Hardware**
  - Hands-on experiences with Jetson AGX Xavier, Jetson Nano, Jetson TX2, Jetson Xavier NX, Raspberry Pi, camera, mobile robot, 3D printer, energy monitor, and robotic arm.
- **Others**
  - Fluent in English and Chinese (Cantonese and Mandarin).
  - Team-spirited, diligent, responsible, open-minded, and self-motivated.

Service

- **Journal Reviewer**
  - ISA Transactions, Ocean Engineering, Journal of Ambient Intelligence and Humanized Computing, Journal of Automobile Engineering, Journal of Engineering Manufacture.
- **Volunteer**
  - Reviewer in Poster Presentation Competition in Discover USC 2024 2024
  - Load shoe boxes onto a trailer (shoe boxes filled with supplies and toys to be distributed to children around the world by Samaritan's Purse). 2021, 2022, 2023

Interest

- **Badminton, volleyball, hiking, tennis, swimming, singing, skiing, and travelling.**